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ABSTRACT

A study was conducted to measure the degree to which groups of infants could generalize color across objects of different forms and sizes and generalize from across objects of different color and sizes and to see whether color or form would dominate in their generalizations. Ss were 8-13-month-old Caucasian infants. All tests had 16 Ss except the first, which had 24. All test toys were red or blue. Tests were counterbalanced in color or form of habituated and choice objects, in position of choice objects, and in age and sex of Ss. Ss were given five tests in which they were given a series of toys with similar properties for periods of two minutes each for Test 1 and three minutes each for Tests 2-5 (for a total of six minutes for each test), after which they were given a choice between a similar toy and a novel one. Ss chose the novel toy in all tests significantly above chance level, indicating an ability to generalize these forms, colors, and sizes. They generalized form more than color and in preference to color. (Author/KM)

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GENERALIZATION OF HABITUATION TO PROPERTIES OF OBJECTS IN HUMAN INFANTS

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The purpose of this study was to measure the abilities of infants to generalize the properties of objects, as it was assumed that such abilities probably play an important part in early concept formation. Specifically, its purpose was to measure the degree to which groups of infants could generalize color across objects of different forms and sizes and generalize form across objects of different color and sizes and to see whether color or form would dominate in their generalizations.

In a preliminary study, groups of 8 - 13-mo.-old infants were observed to choose a high percentage of novel toys over a toy they had played with for 6 min. (87.5%) and a lower percentage after 4 min. (73.3%), 3 min. (66.7%), and 2 min. (60%). Their response rate to a toy tended to decrease with time of exposure to that toy, while their tendency to choose a novel toy afterward increased with increasing exposure. These relationships occurred only if both toys were novel to the infants before they were tested, if there were small initial preference differences between the toys, and if the *S*s were well adapted to the testing situation (Collard, 1962).

The increasing tendency for infants to choose an object with novel properties after increasing habituation to another object can be used to measure the degree to which they can generalize the properties of objects. For example, one could give them a series of toys with similar properties for periods of 2 or 3 min. each for a total of 6 min. and then give them a choice between a toy with similar properties and one with novel ones. By comparing the percentage choice of novel toy after exposure to the series of toys to the percentage choice of novel toy after exposure to only *one* toy for 2, 3, or 6 min., one could measure the degree of generalization of the properties the series of objects had in common. Such a measure would be of interest, because habituation may be evidence of memory (Sokolov, 1963), and its generalization may be involved in early concept formation.

METHOD

The *S*s were 8 - 13-mo.-old infants with an average age of 10½ mo. Most of the *S*s were from white upper-middle-class homes, although a few were from lower-class homes. All tests had 16 *S*s except the first which had 24. All test toys were red or blue. Tests were counterbalanced in color or form of habituated and choice objects, in position of choice objects, and in age and sex of *S*s. Table 1 shows one permutation of each test.

In Test 1, three complex toys were presented for 2 min. each, and then a choice was given between two toys identical except for color. In Tests 2 - 5, toys were made up of three small, medium, or large cubes or spheres and a silver bell strung together on a key chain. Two toys (small and medium) of the same color and form were presented for 3 min. each, followed by a choice between two larger toys: one with properties similar to the former and one with novel properties. The *S*s were left in their mothers'

TABLE 1

Plan of Tests (One Permutation)

Test	Toy 1	Toy 2	Toy 3	Choice	
1	Red complex	Red complex	Red complex	Red complex	Blue complex
2	Red sphere	Red sphere		Red sphere	Blue sphere
3	Red sphere	Red sphere		Blue sphere	Blue cube
4	Red sphere	Red sphere		Red sphere	Red cube
5	Red sphere	Red sphere		Blue sphere	Red cube

a small table with the *E* sitting opposite them. All *S*s were given a 5-min. warm-up period before the tests. After playing with the series of toys, *S*s were shown the two choice objects at a center position out of reach, after which the toys were moved apart and presented at a standard position within reach.

RESULTS

Table 2 shows that these *S*s chose the toy with novel properties in all tests significantly above chance level ($p < .05$, sign test). In all tests they chose the toy with novel properties after the 6-min. exposure to the series of toys a greater percentage of the time than they did after exposure to one toy for 2 or 3 min. indicating that these *S*s were able to generalize these forms, colors, and sizes.

TABLE 2

Generalization of Size, Color, and/or Form

Test	Differences between habituated objects	Differences between choice and habituated objects[a]	*N*	Percentage novel toys chosen after habituation
1	Form different Color same Size different	Form different One color different One color same	24	70.83[b]
2	Form same Color same Size different	Form same One color same One color different	16	75.00[b]
3	Form same Color same Size different	Color different One form different One form same	16	81.25[b]
4	Form same Color same Size different	Color same One form same One form different	16	100.00[b]
5	Form same Color same Size different	One color same, form different One color different, form same	16	81.25[b] (In favor of form)

[a]Both objects larger.
[b]$p < .05$, sign test.

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They generalized form to a greater degree than they did color. For example, in Test 4 in which all toys were of one color and only the two choice objects had different form, they chose the toy with the novel form 100% of the time, whereas in Test 2 when color was the only variable, they chose the novel color 75% of the time. Their degree of generalization was lower when more properties of the objects were varied. In Test 3, in which the choice objects differed in form and were of the same color but of a color different from the toys in the series, the novel form was not chosen as often (81.25% of the time) as in Test 4 in which all toys were of the same color (100% of the time).

Results of Test 5 show that these *S*s generalized form in preference to color. For example, in one permutation of this test, when *S*s were given a series of toys made up of red spheres and then a choice between a toy made up of blue spheres and one made up of red cubes, they tended to choose the toy of the different shape most of the time, and this was true in all permutations. These results are interesting in view of studies showing that 4-mo.-old infants and 2-yr.-old children prefer form to color (Brian & Goodenough, 1929; Spears, 1964). Brian and Goodenough observed preschool children to prefer color and school-aged children to prefer form, but Kagan and Lemkin (1961) found form to be preferred at both ages.

CONCLUSION

Infants 8 - 13 mo. old were able to generalize color and simple form. They generalized form more than color and in preference to color.

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(From Collard, Roberta R. & Rydberg, Jean E. Generalization of Habituation to Properties of Objects by Human Infants)

TABLE 1

GENERALIZATION OF HABITUATION TO SIZE, COLOR, AND/OR FORM BY HUMAN INFANTS

Test	Permutation	Kinds of Toys in Series and Periods of Exposure			Choice Toys		N	Percentage Novel Toys Chosen after 6-Minute Exposure to Series of Toys
		Toy 1 (2 Minutes)	Toy 2 (2 Minutes)	Toy 3 (2 Minutes)				
					Color Difference			
1	1	Red complex	Red complex	Red complex	Red complex	Blue complex	24	70.83*
	2	Blue complex	Blue complex	Blue complex	Red complex	Blue complex		

(Continued on Page 2)

TABLE 1 (continued)

GENERALIZATION OF HABITUATION TO SIZE, COLOR, AND/OR FORM BY HUMAN INFANTS

Test	Permutation	Kinds of Toys in Series and Periods of Exposure		Choice Toys		N	Percentage Novel Toys Chosen after 6-Minute Exposure to series of Toys
		Toy 1 (3 Minutes)	Toy 2 (3 Minutes)				
				Color Difference			
2	1	Small red spheres	Medium red spheres	Large red spheres	Large blue spheres	16	75.00*
	2	Small blue spheres	Medium blue spheres	Large red spheres	Large blue spheres		
	3	Small red cubes	Medium red cubes	Large red cubes	Large blue cubes		
	4	Small blue cubes	Medium blue cubes	Large red cubes	Large blue cubes		
				Form Difference			
3	1	Small red spheres	Medium red spheres	Large red spheres	Large red cubes	16	100.00*
	2	Small blue spheres	Medium blue spheres	Large blue spheres	Large blue cubes		
	3	Small red cubes	Medium red cubes	Large red spheres	Large red cubes		
	4	Small blue cubes	Medium blue cubes	Large blue spheres	Large blue cubes		
				Form Difference, Color Shift			
4	1	Small red spheres	Medium red spheres	Large blue spheres	Large blue cubes	16	81.25*
	2	Small blue spheres	Medium blue spheres	Large red spheres	Large red cubes		
	3	Small red cubes	Medium red cubes	Large blue spheres	Large blue cubes		
	4	Small blue cubes	Medium blue cubes	Large red spheres	Large red cubes		
				Color versus Form			
5	1	Small red spheres	Medium red spheres	Large blue spheres	Large red cubes	16	81.25* (In favor of form)
	2	Small blue spheres	Medium blue spheres	Large red spheres	Large blue cubes		
	3	Small red cubes	Medium red cubes	Large blue cubes	Large red spheres		
	4	Small blue cubes	Medium blue cubes	Large red cubes	Large blue spheres		

*Significant at less than .05 on the sign test

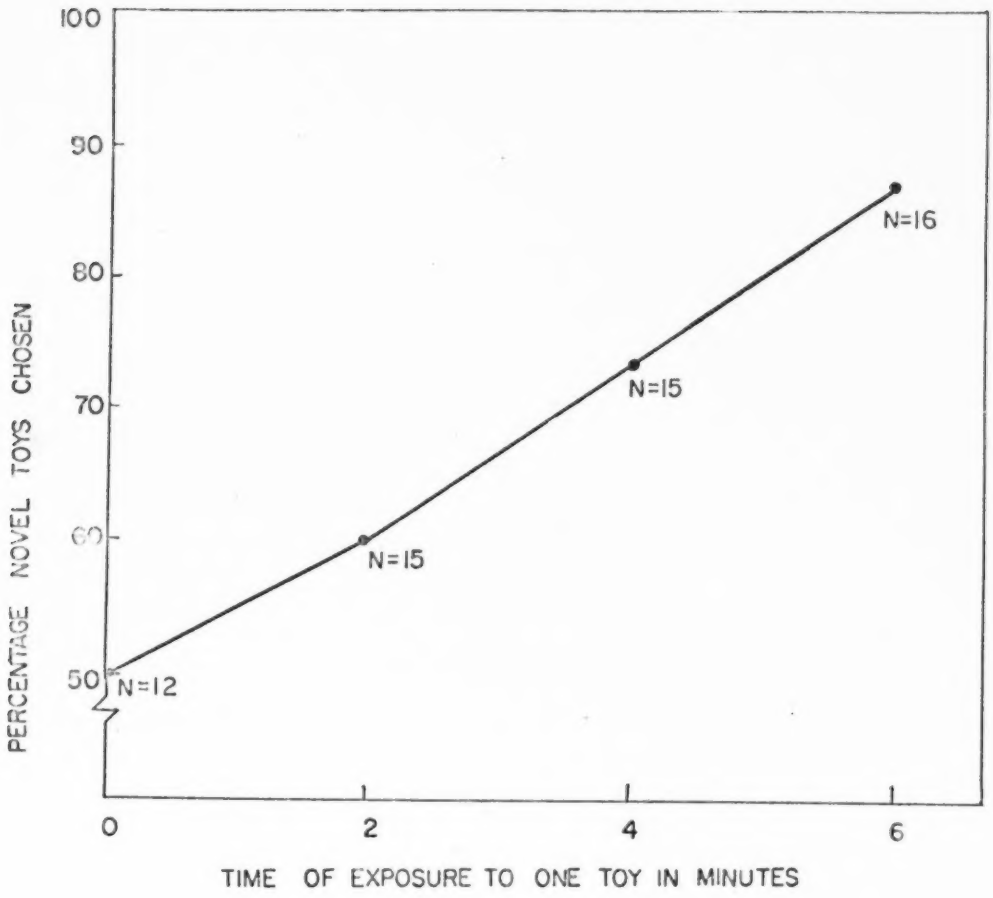

Figure 1. Effect of Time of Exposure to Red or Blue Toy on Percentage of Novel Toys Chosen by Four Groups of Infants.

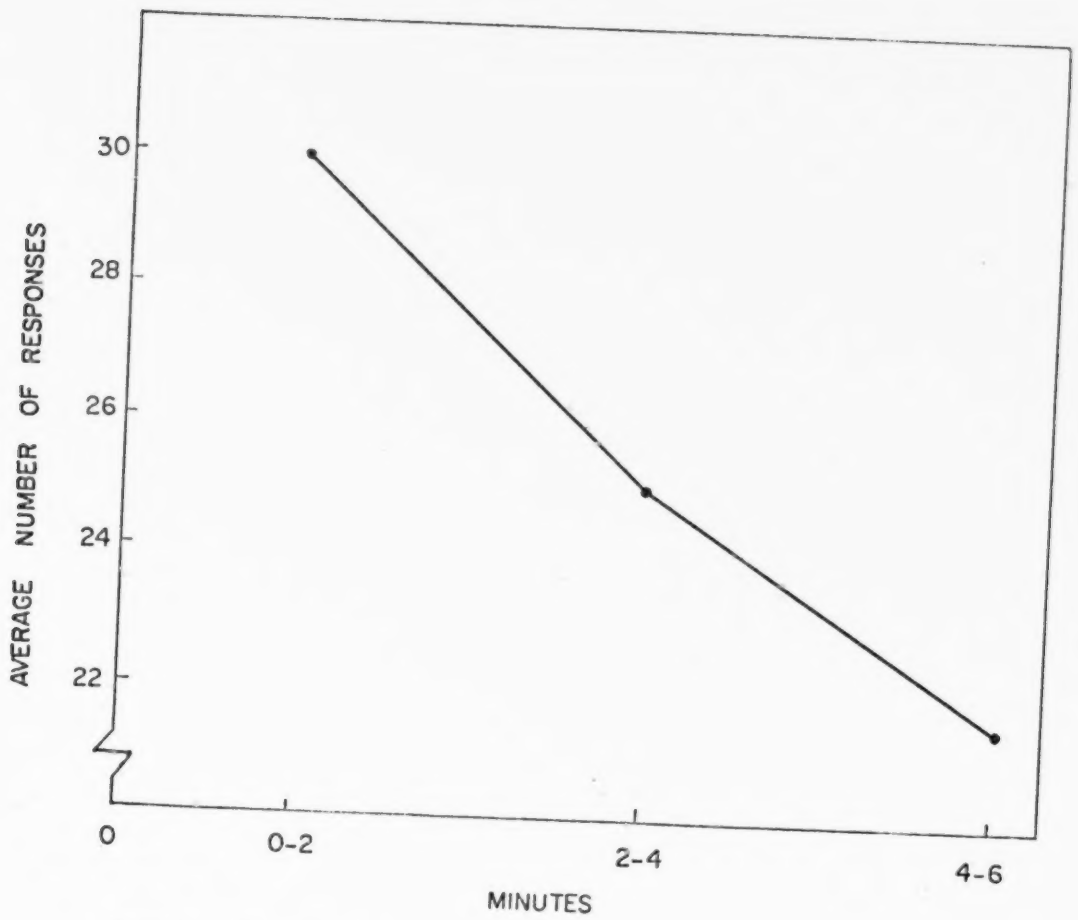

Figure 2. Response Decrease by Two-Minute Intervals in Six-Minute Tests with Red or Blue Bracelet (N=14).

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